

XIV.—*The Microscopical Siliceous Polycystina of Barbados, and their relation to existing Animals, as described in a Lecture by Professor EHRENBERG of Berlin, delivered before the Royal Academy of Sciences on the 11th February 1847.* By Sir ROBERT H. SCHOMBURGK.

[With two Plates.]

PROFESSOR EHRENBERG'S examination of the different specimens of rock which I transmitted to him from Barbados, proved to him that the geological structure of the district called Scotland in that island owed its origin to submarine organic life, a formation which Ehrenberg designated by the term *halibolithic*. These forms of minute organic life were so interesting and surprising, that Professor Ehrenberg gave a preliminary abstract of the discovery in December 1846 to the Royal Academy of Sciences in Berlin, when he described above a hundred species previously quite unknown, and exhibited drawings of eighty species. In the monthly report of the Academy he described 140 new species, divided into twenty-six new and five known genera. Professor Ehrenberg observed at the same time, that the short period which had elapsed since he had commenced the investigation of the rocks of Barbados, rendered it improbable that the prolific source of the new organic forms was exhausted. This multiplicity of new forms was unparalleled in the science of natural history; and he considered it more than probable, that further investigations would make him acquainted with double the number of new forms which he then described. He observed also, that it appeared to him unlikely that the island of Barbados should only contain these peculiar microscopical animals; and he expected that this would prove to be a new page in the book of science; but he scarcely could at that time have supposed that in the space of two months he should be able to announce to the Academy that the number of new forms he had examined so far surpassed his expectation, as to lead him to consider this discovery an intimation that our globe still contains a greater abundance of forms than we had previously any idea of.

Professor Ehrenberg described in 1839, under the name of *Polycystina* (*Zellenthierchen*, 'minute cellular animals'), a section of organic forms which belong to the order of Polygastric animalcules with siliceous shields, containing the genera *Cornutella*, *Flustrella*, *Haliomma* and *Lithocampe**. They had been found hitherto in the chalks and marls of Sicily, in Oran in Africa, and in Greece, and were ascribed to the tertiary period of geologists. At a later period the genus *Lithobotrys* was added, which Ehrenberg discovered in the Tripoli of Richmond in Virginia, and in Bermuda. The number of genera and species de-

* See Taylor's Scientific Memoirs, Parts X. and XI.

scribed previous to Ehrenberg's examination of the Barbados rocks consisted of thirty-nine species, including five genera, which were partly found in a fossil state in rocks of different ages, and partly existed in living forms in the North Sea, and at the bottom of the sea near the South Pole. The discovery of so many additional forms has enabled him to class the *Polycystina* under fifteen genera, all of which occur in the rocks of Barbados in numerous species. The species previously known are now named as follows:—

Cornutella Cassis	=	Cornutella Cassis.
clathrata	=	clathrata.
Lithocampe	=	Eucyrtidium Lithocampe.
obtusa	=	Lophophæna? obtusa.
Flustrella bilobata (Lagena)	=	Rhopalastrum lagenosum.
concentrica	=	Flustrella concentrica.
limbata	=	Perichlamydidium limbatum.
prætexta	=	prætextum.
spiralis	=	Flustrella spiralis.
Lithobotrys cribrosa	=	Lithobotrys cribrosa & triloba.
denticulata	=	Lithopera denticulata.
Galea	=	Lithocorythium Galea.
quadriloba	=	Lithobotrys quadriloba.
triloba	=	triloba.
Lithosambe antarctica	=	Eucyrtidium antarcticum.
aculeata	=	Pterocanium aculeatum.
acuminata	=	Eucyrtidium acuminatum.
aurita	=	auritum.
Auricula	=	auritum?
australis	=	australe.
Hirundo	=	Lithornithium? Hirundo.
lineata	=	Eucyrtidium lineatum.
punctata	=	punctatum.
Radicula	=	Lithocampe Radicula.
solitaria	=	Carpocanium solitarium.
stiligera	=	Eucyrtidium? stiligerum.
Haliomma Amphisiphon	=	Astromma? Entomocora.
Æquorea	=	Haliomma Æquorea.
(cornutum	=	Caryolithis crenata).
crenatum	=	Haliomma crenatum.
didymum	=	Astromma Entomocora?
dixiphos	=	Haliomma dixiphos.
(Lagena [Flustrella])	=	Rhopalastrum lagenosum).
Medusa	=	Haliomma Medusa.
nobile	=	nobile.
oblongum	=	oblongum.
ovatum	=	ovatum.
radians	=	radians.
(radiatum)	=	
radicatum	=	Ceratospyris radicata.
Sol	=	Haliomma Sol.

As long as a few forms only of this peculiar group were known, it was not difficult to assign to them a place in our existing classification: it is however different at present, when Ehrenberg describes nearly 300 species—a larger number of spe-

cific forms than is contained in some classes of animals. "It would be almost impossible," continues Ehrenberg, "to bring 280 different and distinct forms under a general view, were I not to avail myself of a physiological systematical arrangement."

The minute and elegant shells of the *Polycystina* undergo no change upon being immersed and boiled in hydrochloric acid; on the contrary, they are separated from all adherent foreign matter and become as transparent as crystal.

In 1838 Ehrenberg classed provisionally the few fossil forms of *Polycystina* then known, under a separate division of *Polygastrica* with siliceous shells or shields, in expectation that the examination of living forms would point out their true place. But the very distinct and beautiful forms recently discovered, amounting to several hundreds, admit no longer of such an arrangement. The formation of these animalcules is very peculiar, and differs from *Bacillaria* not only in their external form, but also in their internal structure. The reasons which have led Ehrenberg to such a consideration are the following:—

"If it were possible, in a philosophical point of view, to imagine the existence of *Mollusca with siliceous shells* among such as possess shells of a calcareous structure, or to ascribe to nearly related animals, to some a transudation of siliceous matter, to others a calcareous nature, such a supposition would be liable to great objections. The laws intimately connected with the principles of life prescribe the transudation of phosphate of lime from the bones of man and vertebrated animals, and carbonate of lime from the shells of *Mollusca* and skeletons of *Polypi*. A human being, or a vertebrate animal with siliceous bones, appears possible if considered in a logical point of view; but reflections based upon the laws of natural history denounce it as inconsistent, if not illogical. Similar in effect would be the idea of a mollusk with a siliceous shell, or a *Polythalamia* of such a structure—similar to a sickly or anomalous individual of that division; it might indeed be compared to a stone of leather or a medal of wood.

"If we except the *Polygastrica*, such a physiological law separates the *Polycystina* with siliceous shells from all classes of crustaceous and vertebrated animals. It would be impossible to assimilate these constant and well-defined forms to individuals of a sickly organization, as we do not possess forms of a similar structure that might be considered as existing in a perfect and healthy state, to serve as a standard for comparison.

"It remains now to investigate, whether these minute normal bodies of organic nature are of an independent organization, or whether they are merely parts of organic forms; whether their structure is of vegetable or animal origin, or whether they are forms of crystals.

"As we are already acquainted with several instances of living forms of that structure which possess intestines, although their examination has not been quite perfect, the idea of crystallization is rejected as

distinctly as we reject such a supposition in fossil shells and in fossil bones of mammalia; though their cruciform structure (*Kreuzformen*) might *prima facie* afford some shadow of ground for such a supposition. With regard to the possibility of their being of a vegetable nature, although *Phytolitharia*, chiefly *Spongia* and *Tethya*, might afford some analogical points of comparison, the author (Prof. Ehrenberg) rejected such a conjecture as early as the year 1838, since his numerous examinations of sponges from all seas and all geological formations where they had hitherto occurred, made him acquainted with hundreds of forms doubtless of a regular structure and easy of recognition, but never with such forms as indicated development of organization. The great number of *Polycystina* also furnishes arguments opposed to such a supposition in the structure of their shields or shells; and as there are recent specimens existing in the mud at the bottom of the sea, and which possess distinct parts of organization, we are authorized at coming to a similar conclusion with regard to the origin of those in a fossil state. The regular apertures and articulation of the minute shells distinctly bespeak an independent animal structure and development. The large apertures at the extremity of the body possess no analogy among plants, but occur very commonly among animals."

With respect to the affinities which these minute forms of animals bear to the known classes of animal life, Professor Ehrenberg has again assumed that fundamental principle which he adopted in 1835, when he brought before the Royal Academy his classification of the animal kingdom*, namely "a development everywhere equally perfect †." Several circumstances at that time alluded to have since been determined more in detail, but the principal groups and characteristic features have remained unchanged. Accordingly the siliceous-loricated organic forms from the rocks in Barbados differ alike from *Polygastrica* and *Polythalamia*, but develop an important relation to these two groups, which Professor Ehrenberg considers, not upon conjecture, but from actual investigation, to form two separate types of formation. The siliceous shell connects them with the *Polygastrica*, the intestinal structure of which has a radiated form; but the transverse articulation, and the cellular arrangement of their structure, point to a connexion with those which have not a radiated but a tubular formation of the intestinal canal, and the shields of which are always calcareous, and not siliceous. As the intestinal structure of a living form of *Polycystina* has not as yet been examined, Professor Ehrenberg infers, from the physiological formation alone of the whole numerous group, a close analogy to the Moss-animalcules (*Bryozoa*) and chiefly to

* Die Akalephen des rothen Meeres und der Organismus der Medusen der Ostsee. (The *Acalephæ* of the Red Sea, and the *Medusæ* of the Baltic.)

† Das Princip einer "überall gleich vollendeter Entwicklung."

Polythalamia, which contain in the subdivision *Nodosarina* forms very similar to *Polycystina solitaria*, and in *Sorita*, *Pavonina*, *Melonia*, a striking similarity to *Polycystina composita*, *Haliomatina* and *Lithocyclidina*. The cruciform and radiated structure of *Siderolina* and *Siderospira* is likewise present; nay, even the structure of recent oceanic forms may be traced in some. Nevertheless the minute shells of the *Polycystina* possess physiological characters, which, independent of their being siliceous, separate them entirely from *Polythalamia*; such characters namely as the absence of real cavities, the presence of which contributes to a different structure in the *Polythalamia*, and from which peculiarity their name has been derived. It is likewise evident in the greater number of instances, that the articulation of the body does not increase in number with age, as is the case in *Nodosaria* and *Rotalia*, but is individually definite, which is a very important character. Otherwise, the more easily-closed transverse articulation of the *Polycystina* is a character entirely wanting in the *Bacillaria*, which possess a longitudinal structure in their skeleton and development.

These considerations have determined Professor Ehrenberg to relinquish his former opinion that the *Polycystina* constitute a family of Polygastric animalcules, or that they belong to *Arcellina* of compound structure, and he arrives at the conclusion, that they form like *Bryozoa* a subdivision of *Tubulata*, but in this instance with siliceous shields and individual organized forms. They approach most nearly in systematic arrangement to *Polythalamia*, and would occupy a separate group among animals possessed of vessels but without a heart and pulsation, and provided with a simple tubular intestinal canal. The forms developed in the highest degree in that division would be *Holothurix* and *Echinoidea*.

Professor Ehrenberg, in his former paper on *Polycystina*, described five species; two of which belong to the genus *Haliomma*, and are found near Cuxhaven in the North Sea (they are otherwise widely distributed in the ocean): three species also, two of which belong to the genus *Eucyrtidium*, and one to the genus *Lithopera*, have been found at the bottom of the sea near the South Pole. These are—*Haliomma ovatum*, *H. radians*, *Lithopera denticulata*, *Eucyrtidium antarcticum*, *E. australe*. The two first forms, which he himself examined, belong to the *Polycystina composita*, but in consequence of their soft nature their structure remained doubtful. The cells appear to be filled with an olive-brown substance. The other three forms, of which only the empty shells were examined, were found in large numbers among living infusoria at the Antarctic Pole; hence Ehrenberg concludes that they belong to the organic beings of the present period.

The fossil species have been found partly in the calcareous marls (Kreidemergel) from Sicily, partly in the Tripoli formation of Oran, Engia, Zante, from different localities in Virginia and the Bermuda Isles. These different localities belong, according to the prevailing opinion of geologists, to two different periods; and it is consequently important to separate the different species of *Polycystina* which have been found in them.

In the monthly report of the Royal Academy, Ehrenberg described in 1844 eighteen species of *Polycystina* which had been found in the chalk-marls of Caltanissetta. The remainder, with the exception of the five recent forms, would belong to the tertiary formation.

In possession of the materials above indicated, to which may be added a few recent observations that increase the number of fossil species of the tertiary period, Professor Ehrenberg now compares the numerous forms which he found in the rocks from Barbados, 1st, with the recent forms; 2ndly, with those of the tertiary rocks; and 3rdly, with the forms from the chalk or secondary period. The result of the comparison is—that of the 282 species minus 15 which form the rocks in Barbados, only one species (namely *Haliomma ovatum*) can be said with certainty to occur among recent species. Of the eighteen species formerly described as belonging to the chalk formation are eight among the 282 fossil species from Barbados, and a new revision of the Sicilian marls rewarded Professor Ehrenberg with the discovery of six additional species; consequently altogether fourteen which do not differ from those in Barbados specifically, but may be perhaps slight varieties. They are—

Cornutella clathrata.	Haliomma Medusa.
Lithobotrys acuta.	nobile.
Lophophæna obtusa.	Entactinia.
Eucyrtidium Eruca.	Dictyospyris tristoma.
lineatum?	Ceratospyris radicata.
Cycladophora spatiosa.	Flustrella concentrica.
Haliomma Dixiphos.	Astromma Entomocora?

Ten of the forms discovered on a former occasion in the chinks of Sicily were not observable in the rocks from Barbados, and one species, *Eucyrtidium lineatum*, which is most abundant in Sicily, and which occurs likewise in the so-called tertiary rocks, is not only very scarce in Barbados, but its identity is likewise doubtful; however, forms nearly related to it are so very numerous in Barbados that they compose whole masses of rocks. The so-called tertiary Tripoli and tertiary marl, or *halibiolithic* rocks, from Oran, Engia, Zante, Virginia, Bermuda, contain only a few *Polycystina* interspersed here and there: their masses are formed of polygastric shells. According to the former communications of Professor Ehrenberg, they contained twenty-one

forms which agreed in their structure : a few have been added by him more recently. Of those twenty-one, only ten have been found in Barbados ; and of the additions recently made, only a part are to be found in the rocky masses of Barbados. These results lead to the conclusion, " that the *Polycystina* of Barbados, as far as they have been examined, resemble only in a few instances forms now living, and come nearer in structure to those which are contained in the rocks of the secondary period than in those of the tertiary formation."

Of other siliceous forms which constitute the rocky masses of Barbados, Professor Ehrenberg mentions, besides the *Polycystina*, three other groups :—

1. Some of the specimens of rocks contain shells of Polygastric Infusoria ; in others they are entirely absent. Of eighteen species with siliceous shields found in Barbados, only one agrees with the chalk formation of Sicily, and only two with those found in the tertiary rocks of Oran, Engia, Zante, Virginia and Bermuda. It is very remarkable that many of the Barbados forms of animalcules are quite peculiar, and do not occur in any other locality on the globe as far as hitherto known to Professor Ehrenberg. A number of these new and peculiar forms constitute three, or perhaps four new genera, which Professor Ehrenberg calls *Actinogonium*, *Dictyolampra*, and *Liostephania*. *Biddulphia cirrhus*, a new species, is very abundant, and the new genus *Liostephania* with its varied forms apparently constitutes three new species.

2. The *Phytolitharia* consist of fragments of *Spongilla* and *Tethya*, of which only a few are peculiar. Professor Ehrenberg described twenty-seven species. The most remarkable form appears to be *Spongophyllum cribrum*, which is likewise found in the rocks of Caltanissetta, but it is much more frequent in the marls of Zante, where it occurs almost in masses. *Amphidiscus annulatus* and *Spongolithis annulata* are especially distinguished in their structure. The *Spongophyllia* are so remarkable that Ehrenberg considers them the commencement of a new series of forms hitherto unknown, belonging neither to *Tethya* nor to *Spongia*. *Phytolitharia* derived from freshwater or terrestrial plants do not occur in any of the rocks.

3. The third group of siliceous fragments in the Barbados marl consists of perfectly new and very peculiar forms, which are called *Geolithia* by Ehrenberg. They are regularly formed and consequently easily recognizable, and considered as siliceous fragments of animals, they may prove as useful for geological purposes as *Phytolitharia* are with respect to plants, and *Zoolitharia* in calcareous fragments as regards animals. They are neither fragments of *Spongia* nor of *Tethya* ; but occasionally parts of *Polycystina* are recognized. Ehrenberg frequently observed the beaks and heads of *Eucyrtidia*, or the nuclei of *Ha-*

liommatina; likewise the posterior apertures of the shields or shells of several forms which appear in elegantly-shaped denticulated rings; or the lateral rays, spines and feet occur in a free spinulate form; and the broken trellis-like portions of their bodies might be compared to siliceous nets. In some of the specimens of rock where the forms are well-preserved, the origin of the fragments is easily recognized; this is unfortunately seldom the case; and Ehrenberg observes, that under such circumstances it is requisite to draw a conclusion from such fragments as are recognizable, in a similar manner as in a geological point of view sharks' teeth must serve to determine the species from which they came. Hence Professor Ehrenberg has divided the *Geolithia* into the following groups, which for the sake of analogy he terms only provisionally genera:—

Stelliform siliceous fragments	<i>Actinolithis.</i>
Net-like " "	<i>Dictyolithis.</i>
Annular " "	<i>Stephanolithis.</i>
Tabular " "	<i>Placolithis.</i>
Staff-like " "	<i>Rhabdolithis.</i>
Nuciform cellular fragments (Polycystine nuclei) ..	<i>Caryolithis.</i>
Cephalotic and rostrate fragments (Polycystine beaks)	<i>Cephalolithis.</i>

In some instances the whole geological specimen from Barbados is composed of such fragments, in which case it becomes difficult to determine the true species; the genera however are easily defined. In the atmospheric dust borne along by the storm, and in the dust from the craters of volcanos, it will henceforth be easier to recognise the siliceous forms of *Geolithia*, and to compare and determine them with as much certainty for the purpose of geological deductions as the spines of *Echini*, the teeth of fishes, scales and bones of various kinds.

Ehrenberg has determined twenty-seven species of *Geolithia*, several of which bear no relation to any of the 282 species of *Polycystina* from Barbados, but possess nevertheless well-defined characteristic forms. If any of these fragments should hereafter be discovered in atmospheric dust, we should be authorized to consider Barbados as its source. The remarkable genera *Actinolithis* and *Placolithis* are quite unknown with respect to their origin.

"If an unknown net-like or reticulated fragment is hereafter named a *Dictyolithis* of such a form and size, it will be a more appropriate and shorter description, and less subject to error, than if described as *Podocyrtdis* or *Spongiæ*, or *Eucyrtdii fragmentum*, or by any other name. Where it is not requisite to notice mere fragments, no person would reasonably enumerate them."

Professor Ehrenberg has next directed his attention to the partly organic, partly morpholithic calcareous ingredients, which, besides the siliceous, are contained in the Barbados marl. The organic parts consist of a small number of *Polythalamia*: the

morpholithic, which have the appearance of a secondary formation, differ in some respects from the chalk *Morpholithes* (*Kreide-Morpholithen*), being sometimes stelliform, sometimes elliptical with a nucleus.

The rocks in general containing these forms, which are sometimes scarcely discernible, at other times little changed, and occasionally surprisingly well preserved, are partly Tripoli, very friable and whitish in appearance, partly compact calcareous sandstone, and become marly by a combination with a considerable quantity of calcareous earth.

In some localities the strata of marl contain semi-opal, and occasionally veins of a carboniferous appearance. Burnthill, which has been considered by some of the inhabitants to be of volcanic origin, does not show any traces of having been on fire on the summit; the rocks have received the blackish appearance from the admixture of bitumen, which they lose when subjected to fire. They contain *Polycystina* in good preservation*.

The semi-opal is a very remarkable character of the Barbados formation, which has hitherto not occurred in calcareous marls, while on the other hand flints, which are so numerous in the European chalk formation, are entirely wanting in Barbados. Semi-opal occurs sometimes in Europe in the tertiary biolithitic Tripoli.

Another remarkable peculiarity of the Barbados marls is the large admixture of pumice, which would almost authorize the denomination of a volcanic tufa. One of the geological specimens, from Skeete's Bay (No. 58), consists of a pure volcanic tufa. Professor Ehrenberg does not recollect having previously met with a similar combination of volcanic dust or ashes, chalk and marl; and it is his opinion "*that these rocks, which consist of volcanic ashes and organic remains, formerly constituted a submarine bottom which was subsequently raised, and hence these rocks belong to a much older period than the coralline rocks which rest upon the former and constitute the largest portion of the superficial area of the island.*" The whole formation of the island possesses a uniformity of character which is only modified by different combinations, changes and transformations.

The minute forms of organic life in the rocks of Barbados, as far as investigated by Professor Ehrenberg in February 1847, consist of the following groups:—

	Species.
<i>Polycystina</i>	282
<i>Polygastrica</i>	18
<i>Phytolitharia</i>	27
<i>Geolithia</i>	27
<i>Polythalamia</i>	7
	361

Of these more than three hundred are new forms.

* There is a tradition in existence that this hill was burning for the space of five years, the bitumen having been set accidentally on fire.

The following tabular survey of Ehrenberg's description of the Barbados animalcules exhibits the large new group of *Polycystina*, which, as will be observed, now consists of 282 species, subdivided into seven families and forty-four genera. The nature of the limitation of the individual animals, and in the individuals, the apertures in the shield, of which the anterior aperture is generally lattice-like or fenestrate, and the posterior one open, have been used in a physiological point of view to furnish the important and necessary characters for the greater divisions, subdivisions, and generic differences of the group.

A short Systematic Arrangement of the Families of Cellular Animals.

Polycystinorum Familia.

I.—POLYCYSTINA SOLITARIA.

Testæ siliceæ spatio interno ample pervio aut passim levius transverse constricto.			
Testæ apertura unica (simplex aut cancellata)	} Spatium internum liberum (articuli, dissepimenta, stricturæ nulla)	I. <i>Halicalyptrina</i> .	Gen. III. Sp. 13
		} Spatium internum stricturis articulatim contractum	II. <i>Lithochytrina</i> .
Testæ apertura duplex, anterior sæpius cancellata, posterior tota aperta			III. <i>Eucyrtidina</i> .

II.—POLYCYSTINA COMPOSITA.

Testæ siliceæ spatio interno celluloso aut strictura longitudinali constricto.			
Testæ nucleo destitutæ (associatæ et coalitæ)	} Cellulæ binæ clathratæ nucleus forma amplæ, strictura longitudinali levius discretæ	IV. <i>Spyridina</i> .	V. 36
		} Cellulæ numerosæ parvæ, ordine concentrico, spirali aut nullo (spongiose) in orbes consociatæ, interdum radiatæ	V. <i>Calodictya</i> .
Testæ nucleatæ (involutæ)	} Simples, subglobosæ aut lenticulares, interdum margine simpliciter elegantissime radiatæ . . .		VI. <i>Haliommatina</i> .
		} Parte media nucleata (ocellata) margine subconcentrice, celluloso aut spongioso (forma complanata orbiculari interdum eleganter lobata et stellata aut margine radiata) . .	VII. <i>Lithocyclidina</i> .

Polycystinorum Genera.

I.—POLYCYSTINA SOLITARIA.

HALICALYPTERINA.

Apertura patens ampla	{	sensim amplior (forma conica)	Species.
Apertura constricta aut cancellata (forma subglobosa)		subito ampla (forma campanulata)	8
			2
			3

Corautella 8
Halicalyptera 2
Haliphormis 3

LITHOCHYTRINA.

Testæ strictura unica	{	neutro fine lobato	{	appendicibus laterum nullis	Species.
		capitulo (?) lobato		latera spinis alata	6
Testæ stricturae plures	{	postremo articulo integro	{	appendicibus mediis nullis	4
				aperturam simplicem	7
				aperturam cancellatam	3
		postremo articulo lobato aut aculeorum corona ornato		4	3

Lithopera 6
Lithomelissa 4
Lithobotrys 7
Lithocampe 3
Lithocorythium 4
Lithornathium 3
Lithochytris 4

EUCYRTIDINA.

Testa simplex continua,	{	non constricta (postremo fine lobato aut fimbriato)	{	articuli postremi	{	costæ a capitulo oriundæ in spinas terminales productæ	Species.
aperturam amplam		aperturam amplam		capitulo extus non discreto		2	
		costæ spinoscentes	{	nullæ	{	(sepe cristato) spinarum compositarum	2
		capitulo strictura externa discreto				rona postrema nulla	1
Testa semel constricta	{	articuli postremi	aperturam constrictam	sepe appendicibus stiliformibus, pedicellisve ornata	{	rona terminali	10
						spinarum aut laminarum compositarum	9
						frontis aculeo nullo aut frontis aculeo spinuloso	13
		corporis utroque fine arcuato	{	appendicibus postremis mediisque nullis	{	simpliciter	56
		aperturam constrictam				frontis aculeo nullo aut frontis aculeo spinuloso	10
Testa duabus pluriusve structuris articulatam	{	corporis postremo fine non arcuato	aperturam constrictam	sepe appendicibus postremis spinosis, mediis nullis	{	a secundo inde articulo	25
						a tertio inde articulo	8
						postremo margine integro	1
		postremo margine laciniato		5	2		
		postremo margine productis cellulosis		2	2		
		aperturam constrictam a secundo articulo, alarum instar, productis		3	3		

Carpocanium 2
Dictyophimus 2
Cryptoprora 1
Lophophena 10
Anthocyrtes 9
Lynchocanium 13
Eucyrtidium 56
Thyrsocyrtis 10
Podocyrtis 25
Rhopalocanium 8
Cycladophora 5
Calocyctas 2
Dictyopodium 2
Pterocodon 3

II.—POLYCYSTINA COMPOSITA.

SPYRIDINA.

Testarum binæ clathratae cellulae	{	apertura clathrata media	<i>Dictyospyris</i>	Species, 9
		{	<i>Pleurospyris</i>	1
		apertura clathrata laterali		
		simplicibus	<i>Ceratospyrus</i>	14
		ramosis	<i>Clatospyrus</i>	2
		laminarum corona aperturam vinciente	<i>Petalospyrus</i>	10

CALODICTYA.

Testarum intus spongiosarum et nucleo destitutarum orbes	{	non radiati (Flustrarum instar) { disci limbo nullo	<i>Flustrella</i>	2
		{	<i>Perichlamydidium</i>	2
		radii liberi { simpliciter stiliformibus	<i>Stylodictya</i>	7
		{	<i>Rhopalastrum</i>	1
		lobati aut radiati (Stellarum instar) { radii liberi { spongiosis { membrana cellulosa basi conjunctis	<i>Hastiastrum</i>	2
		{ radii vinculo celluloso, serti instar, apice conjunctis	<i>Stephanastrum</i>	1

HALIOMMATINA.

Testæ subglobosæ, nucleus radiatus	{	radii duo spinescentes producti a centro { testæ externæ cellulae in superficie sola	<i>Stylosphaera</i>	6
		inde oppositi { testæ ext. cell. in serie multiplici spongiosæ	<i>Spongosphæra</i>	1
		radii plures e centro exeuntes (exserti aut non exserti) { margine testæ nullo aut radiato	<i>Haliomma</i>	22
		{ margine integerrimo circulari	<i>Chilomma</i>	1

LITHOCYCLIDINA.

Testarum disci in media parte nucleati margine celluloso	{	integro orbiculari, nec radiato	<i>Lithocyclia</i>	2
		lobato aut radiato (stellari) { non lobato radiis simpliciter spinescentibus	<i>Stylocyclia</i>	1
		{ lobato radiis cellulosis liberis (apice sæpe spinescentibus)	<i>Astromma</i>	4
		{ lobato radiis cellulosis membrana cellulosa a basi conjunctis	<i>Hymeniacstrum</i>	1
			89	
			193	
			282	

A short Diagnosis of the three new Polygastric Genera.

1. *Actinogonium*.
Animalculum e Polygastricorum Bacillariis Naviculaceis prismaticis non concatenatis, testæ suborbicularis angulis 7 (aut pluribus?).
A. septenarium.
2. *Dictyolampra*.
Animalculum e Polygastricorum Bacillariis Naviculaceis orbicularibus non concatenatis, testæ bivalvis disco aperturis non perforato, dissepimentis internis nullis, valvulis paribus in solo medio disco cellulosis, in lævi margine radiatis.
D. Stella.
3. *Liostephania*.
Animalculum e Polygastricorum Bacillariis Naviculaceis orbicularibus non concatenatis, testæ bivalvis disco aperturis non perforato, dissepimentis internis nullis valvulis paribus (?) in medio disco et in margine lævibus, radiatorum, sæpe validorum, corona centrum læve cingente.
L. Rotula, radiis (6—14) simplicibus.
L. comta, radiis (6—13) supra punctorum corona conjunctis.
L. magnifica, radiis (12), infra radiolis binis, supra punctis interpositis.

EXPLANATION OF PLATES V. AND VI.

The figures contained in these plates represent a few of the numerous elegant forms of the cellular animalcules of Barbados, magnified from 200 to 100 times in diameter*.

The figures 1 to 7 are solitary animalcules, and belong consequently to the first division of *Polycystina*.

The figures 8, 9, 10 are forms of compound animalcules (*Polypenstöcke*) belonging to the second division of *Polycystina*, and are of a similar relation as *Peneroplis* and *Pavonina* among *Polythalamia*.

PLATE V.

- Fig. 1. Eucyrtidium Ampulla*, front view.
Fig. 2. " " seen from below.
Fig. 3. " " seen from above.
Fig. 4. Rhopalocanium ornatum.
Fig. 5. Podocyrtris Schomburgkii.

PLATE VI.

- Fig. 6. Anthocyrtis Mespilus*.
Fig. 7. Lychnocanium Lucerna.
Fig. 8. Haliomma Humboldtii.
Fig. 9. Astromma Aristotelis.
Fig. 10. Stephanastrum Rhombus.

It has been considered preferable to omit some of the minor figures of the original plate, and to substitute his interesting *Eucyrtidium Ampulla* as seen in different positions, a drawing of which was obligingly furnished for that purpose by Professor Ehrenberg.

* Professor Ehrenberg observes, that these illustrations are magnified about a third less than his figures of *Polygastrica*, which are uniformly magnified 300 times.